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Meeting of the RAP ICCAT Working Group

June 29, 1999
St. Andrews, NB

John D. Neilson, Chairman
Marine Fish Division
St. Andrews Biological Station
St. Andrews, New Brunswick
E0G 2X0

August, 1999

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ABSTRACT

The RAP ICCAT Working Group was formed in 1999 with the mandate to provide scientific review of the Canadian inputs to the stock assessments of the International Commission for the Conservation of the Atlantic Tunas (ICCAT). The species of main interest to the working group are bluefin tuna and swordfish. This paper summarized the discussions of the first meeting of the working group, which focussed on swordfish.

RÉSUMÉ

Le Groupe de travail sur le CICTA du PCR a été créé en 1999, et a le mandat de faire l'examen scientifique des apports du Canada aux évaluations de stocks de la Commission internationale pour la conservation des thonidés de l'Atlantique (CICTA). Les espèces qui intéressent principalement le groupe de travail sont le thon rouge et l'espadon. Le document résume les discussions de la première rencontre du groupe dont le seul sujet était l'espadon.

INTRODUCTION AND BACKGROUND

In autumn 1999, ICCAT will be assessing swordfish stocks. The RAP ICCAT Working Group met on June 29 in St. Andrews, NB, and reviewed two working papers that are intended as Canadian contributions to the swordfish assessment. The first working paper, ICCAT SCRS/99/76, documents the development of a sex-specific, age-disaggegrated catch rate series for the Canadian longline fishery, and compares the results with the previous approach that combined the information by sex. The second working paper, SCRS/99/77, provides preliminary estimates of the dead discards of swordfish and bluefin tuna in the Canadian swordfish fishery.

The Agenda for the meeting is provided in Appendix I. Meeting attendees are listed in Appendix II.

SWORDFISH REVIEW

The Chairman opened the meeting by welcoming participants and providing an overview of the mandate of the working group and the meeting agenda. Julie Porter then provided background into the ICCAT stock assessment process and how the Canadian input has been used in previous assessments. She also provided background on the 1999 work plan for the ICCAT swordfish stock assessment. These presentations were provided as background information for meeting participants, and were not tabled for review.

Review of SCRS/99/76 (Stone and Porter (authors), "Age-Specific CPUE for Canadian Swordfish Longline for Combined and Separate Sexes, 1988-1998")

Presented by: Heath Stone, **Rapporteur:** Stratis Gavaris.

The paper summarized results from an analysis of longline catch rate data to derive a CPUE abundance index. The previous unisex by age analysis was updated with data from recent years and a new analysis by sex and age was also investigated. Since the historic low CPUE observed in 1996, CPUE has increased in 1997 and 1998, possibly indicating an increase in abundance. Much of the discussion in the Working Group dealt with the interpretation of the CPUE increase, and alternative explanations for it. These points are summarized in the following pages.

The harpoon fishery was not used to derive a CPUE abundance index because of difficulties incorporating searching time. It was recommended that consultation with harpoon fishermen be undertaken to explore possibilities.

The analysis of swordfish longline catch rate data assumes that the nature of this fishery has not changed substantially over the period 1988-98, at least with respect to aspects which might impact catch rates. The following discussion points relate to this issue:

- The large pelagic longline fishery may target tunas or swordfish with the majority of swordfish targeting occurring in August and September. It was noted that the fishery was more tuna directed in recent years due to reduced swordfish quotas. This change may influence the catch rates, even though a factor for swordfish targeting was included in the model. It was also noted that classification of swordfish targeting was based on weight. It was suggested that classification based on numbers may be more appropriate, however these data are unavailable in the computer data base at present. It was **recommended** that an analysis of CPUE trends for August and September data only, the period when swordfish are targeted, be undertaken. If the trends differ, the August/September CPUE might be a better reflection of swordfish abundance.
- In association with the increase targeting of tuna, the fleet has shifted to using circle hooks almost exclusively. This conversion occurred over the past 5 years. Circle hooks are thought to retain hooked fish better but swordfish are more susceptible to foul hooking on J hooks. It was not clear if circle hooks selected for a different size of swordfish. It was **recommended** that a comparison of catch rates by the 2 hook types be undertaken using any available data or information which fishermen could supply. These data are presently unavailable in the computer data base.
- It was reported that mackerel has typically been the bait of choice for the swordfish fishery and this has not changed over time.
- There was considerable increase in the number of active licenses between 1988 and 1993 and a decline in 1997 and 1998. Changes in catch rates during this period could reflect the entry of inexperienced fishermen and a subsequent learning process. Higher catch rates seem to be associated with periods of low active licenses. This may also be indicative of gear crowding or limited "prime" grounds (berths). Development of a CPUE abundance index based on a consistent set of index fishermen has not been possible because CFV is the only identifier in the database and the same captain is not always associated with a CFV. It was **recommended** that the industry's co-operation be solicited to help identify a consistent set of index fishermen. It was also suggested that alternatives to classifying fishing on "prime" grounds versus less desirable grounds might be pursued. However, such analyses will be difficult or impossible as "prime" grounds are not easily quantified and may change from set to set.
- There have been recent changes to minimum size regulations as well as institution of closed broodstock areas but the impact of these management measures on catch rates was not investigated. It was suggested that CPUE indices for younger ages may have been affected by these measures to reduce capture of small fish. It is **recommended** that this be considered when interpreting CPUE for younger ages as the catchability may have changed over years.

It was widely recognized that **environmental conditions** can have a significant influence on CPUE. The analysis attempts to remove any environmental aspects that might be associated with seasonal or spatial variations but these are at a very coarse level. Further investigation of using local environmental co-variates is encouraged. The following discussion points relate to this issue:

- Fishermen noted that swordfish were more available in 1997-98 than in previous years. Increased abundance could be a factor but changes in environmental conditions would also contribute. An increase in bait, better weather and broader areas of suitable temperature water masses were reported. In previous years, favorable conditions were patchier. Each year

involves some "learning" to find the areas and depths at which favorable conditions occur. It was suggested that abundance trends for bait, e.g. squid, herring, etc. be summarized by area. However, there are no surveys beyond the continental shelf that could provide such data.

- Fishermen observed that temperature has an important effect on availability of small swordfish. During warmer conditions, smaller swordfish are more available. This is consistent with the observed increase in proportion of males, which are smaller than females, during the latter part of the year when water temperature is thought to increase.

Log records of **catch and effort** from 1988-98 were analyzed using a multiplicative model to account for area, month and targeting effects. The following discussion points relate to data comparability and patterns in model results:

- Some notable differences in nominal catch rates exist when catch/trip is compared to catch/thousand hooks. This difference may be due to variable trip duration and/or to weather conditions during the trip. The trip duration is affected by vessel size and some of the larger boats may not be active to the same degree each year. If this is the case, catch/thousand hooks should be preferable but it is **recommended** that the variation in trip duration be confirmed. It was noted that the larger boats had greater scope to go further offshore in search of favorable conditions with the consequence that their catch rates may be higher. It may be worthwhile exploring a vessel size effect in the model but at a minimum, it is **recommended** that the vessel size composition by year be documented.
- Other countries, notably the USA, fish in some of the same areas as Canada. It is expected that catch rates from the various fleets should reflect the abundance in commonly fished areas. Treating data from all countries by biological areas, as opposed to the current statistical areas, in a combined analysis may overcome some of the perceived data limitations. Further consideration should be given to alternatives for aggregating the trends in the various biological areas. It is **recommended** that initial exploration of these issues be considered using combined Canadian and USA data for feeding area 91.
- There appears to be a discontinuity in the data and the results between 1992 and 1994. Mandatory submission of log records was introduced in 1994. It is not clear if the vessels submitting log records between 1988-93 were representative of the fleet. The decline in CPUE between 1992-94 may have been impacted by this change in statistical reporting. The reporting since 1994 covers a broader season than in earlier years. Possible complications arising from this change should be evident from the analysis of August and September records which was **recommended** above. The change in hook type also roughly corresponds with this discontinuity. It was **recommended** that the comparability of data prior to 1992 or 1993 be considered suspect in subsequent use as indices of abundance.
- Concern was expressed about possible interactions of area/month effects with year. It was reported that previous investigation of year interactions was not conclusive but more years are available now. It was **recommended** that year interactions be investigated.
- The results displayed strong year effects at all ages and little evidence that year-class strength could be identified and followed over ages. This lack of internal consistency undermines interpretation of the CPUE series as reflective of abundance. It is **recommended** that subsequent use of this and other CPUE series be carefully scrutinized to validate their

interpretation as indices of abundance. (Recommendation for the attention of the ICCAT Swordfish Working Group).

An overview of the **previous assessment results** was presented to provide a context for use and interpretation of the CPUE abundance index. The following points of discussion were related to this aspect:

- The decline in CPUE during the early 1990s seemed more pronounced for the Canadian series than for CPUE series of other nations. It was noted that this may be related to the perceived discontinuity discussed above. It was **recommended** that the time series of Canadian CPUE be compared to the VPA results to investigate any evidence for a discontinuity, i.e. was there a marked time trend in the residuals.
- The assessment results suggested a decline in abundance of older fish. This was not consistent with the relatively constant average weight of swordfish in the Canadian catch. However, it was noted that ICCAT has strong reservations about the use of average weights in this context as they are strongly influenced by market demands. It was also noted that he Canadian CPUE did not show a markedly greater decline for older ages.
- The order of magnitude higher CPUE for ages 9+ male swordfish was considered peculiar. It suggests that males continue to be partially recruited to the fishery for ages beyond age 9, however catch rates for ages 2 to 5 males are quite high. It is **recommended** that the revised sexed catch at age results which have been extended to ages 9+ be carefully scrutinized to confirm their reliability, including consultation with other ICCAT scientists
- Fishermen's perception was that abundance has not varied greatly over time. There appears to be some increase in the most recent years, particularly of small swordfish. The fluctuations in the CPUE may largely reflect availability which is influenced by environmental conditions.

The Working Group recognizes the many weaknesses, detailed above, with respect to interpreting the CPUE series as abundance indices. Pursuit of the recommendations may improve the situation but it is anticipated that many of the important recommendations will not be investigated prior to the assessment update. The Working Group also noted that the representative of the longline fleet supported the use of CPUE for the fleet as an index of abundance. The Working Group endorses submission of the Canadian CPUE series as candidate abundance indices but strongly recommends that this and all other series be critically evaluated at the assessment stage.

Review of SCRS/99/77 (Porter, Wood and Stone (authors), "Estimation of the Tonnage of Dead Swordfish and Bluefin Tuna Discards from the 1998 Canadian Swordfish Longline Fishery")

Presented by Julie Porter **Rapporteur:** Rob Stephenson.

The paper had been prepared in response to a Commission request for estimates of dead discards, for use in the upcoming assessment.

There was considerable discussion on the problem of **sample coverage** and extrapolation. Observer coverage was focused on the "Test Fishery" in August west of the 65º30' line, and on an end-of-season fishery to monitor the remainder of the swordfish quota. Neither reflected the spatial and temporal coverage of the swordfish fishery. There was little sampling east of 60º (*none* east of the Laurentian Channel), and there was no sampling of major portions of the regular fishery (e.g., during May, June, July, and August). Some industry participants suggested that the extrapolation had led to an erroneous conclusion that one in three swordfish were being cut off. Several options for extrapolation of the observer data to the entire fishery were discussed. It was **concluded** that the estimate of total dead swordfish discards be based on the following assumptions (as presented in Section 3.2.1 of the Working Document):

- No discards from harpoon fishery,
- Test fishery observer data used for test fishery only,
- Observations from east of 60º would be applied to Newfoundland and 4V data,
- Observations from W of 60º would be used for west of 60º,
- There was no stratification by month,
- No attempt was made to estimate the subsequent mortality of swordfish released alive.

The **regulation of a minimum size** with no tolerance, which was put in place to protect small fish has resulted in (1) discarding/dumping of small swordfish and tuna, (2) and a loss of data on these smaller animals in the catch. It was suggested that this management strategy was not working, and that it should be reviewed. Further, it was noted that the observer coverage had not been directed in order to get an accurate picture of this fishery – but to monitor specific important management questions. Documentation of the magnitude of the small fish problem (and related problem of dead discards) would require substantial change to sampling, in order to achieve appropriate temporal and spatial coverage. It was **recommended** that there be consideration of improved sampling for future fisheries, and that Science should be consulted in the deployment schedule.

NMFS estimates **of discards in the USA fishery** off the Grand Banks in 1996 were referred to, and it was suggested that such information be compared with Canadian estimates. However, the comparability may be questionable, as the USA fishery occurs further to the east in warm water and thus is more likely to catch small fish. Further, little is understood about inter-annual variation in the catches of small fish. The Canadian 1997 and 1998 data showed substantial

differences in the rates of discarding during the test fisheries and were therefore not extrapolated to other years. For these reasons, caution should be exercised when extrapolating from the 1996 USA data.

The estimate of dead bluefin discards (Section 3.2.2 of the Working Document) was accepted but with the same caveats as discussed for swordfish.

Overall, it was considered essential that there be a full discussion in the working paper of the inadequacies of the observer coverage, and of the impact of this sampling problem on the resulting estimate. The estimate of dead swordfish discards in the Working Document was thought by industry participants to be an overestimate, and the estimate of dead bluefin discards an underestimate, but they did support the recommendation that the estimates be reported with the appropriate qualifications.

It was agreed that the Working paper be modified to include:

- estimates of variance
- a thorough discussion of the sampling inadequacies (including a table of monthly catch and observer coverage by area).
- Distinguish between swordfish "discarded dead", and swordfish "released alive" (note terminology)
- The bottom line of the paper should include both the observed tonnage of dead discards and the estimate of total tonnage from the analysis in the working paper along with a clear statement of the caveats and the note that the estimate may have limited validity. It was **recommended** that Table 1 of the ICCAT Executive Summary have a footnote to qualify the figure in the table, e.g., In the body of the table, put the 51.7 MT of swordfish estimated to be discarded, and then add a footnote –

  " The observed dead discards from Canadian Observer coverage of the swordfish longline fleet were 5.5 MT of swordfish and 1.3 MT of bluefin tuna. SCRS/99/77 shows the calculation of the estimate of the tonnage of dead discards from the entire catch (51.7 MT of swordfish and 16.3 MT of bluefin tuna), however there are concerns about the validity of the estimates in 1998, due to sampling problems."
- No decision was made as to which figure should be used in the swordfish VPA. However, the senior author will **recommend** to ICCAT the use of the 51.7 MT estimate, and provide the catch-at-size for this tonnage. 51.7 MT is probably closer to the "truth" than 5.5 MT.

CLOSING REMARKS

The meeting adjourned at 6:30 PM, after the Chairman thanked the participants for their interest and active participation.

Appendix I

RAP ICCAT Working Group (Swordfish)
29 June 1999
St. Andrews Biological Station
Conference Centre
9:00 AM – 4:00 PM

AGENDA

1. Welcome and introduction (J. Neilson)
2. Overview of ICCAT swordfish stock assessments, and work plan for 1999 (J. Porter)
3. Review of Canadian standardized CPUE (H. Stone)
4. Review of Canadian dead discard data (J. Porter)
5. Recommendations and conclusions (J. Neilson)
6. Closing

Appendix II
Meeting Participants

Attendee	Affiliation	FAX	E-Mail
Troy Atkinson	NS Swordfisherman's Association	902-457-4990	Hiliner@ns.sympatico.ca
John Angel	NS Swordfisherman's Association	902-826-7065	Jangel@navnet.net
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Franklyn d'Entremont	NSSHA	902-762-2654	
Dale Richardson	NSSHA	902-656-2595	
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Travis Shepherd	DFO, SABS	506-529-5862	
Gretchen Fitzgerald	Ecology Action Centre		Fitzgerg@152.dal.ca
Mark Butler	Ecology Action Centre	902-429-2202	Ar427@chebucto.ns.ca
Bruce Mayne	DFO, St. John's, NFLD	709-772-3628	
Mike Calcutt	DFO, Ottawa	613-990-0096	Calcuttm@dfo-mpo.ca
Peter Perley	DFO, St. Andrew's	506-529-5862	Perleyp@mar.dfo-mpo.gc.ca
Marty Henneberry	Ivy Fisheries Ltd.	902-868-2638	
John Neilson	DFO, MFD, SABS	506-529-5862	NeilsonJ@mar.dfo-mpo.gc.ca
Julie Porter	DFO, MFD, SABS	506-529-5862	PorterJ@mar.dfo-mpo.gc.ca
Kris Kirk	Ivy Fisheries Ltd.	902-868-2638	

Appendix III

RESEARCH RECOMMENDATIONS

*From the discussions of: **Review of SCRS/99/76 (Stone and Porter (authors), "Age-Specific CPUE for Canadian Swordfish Longline for Combined and Separate Sexes, 1988-1998")***

1. The **harpoon fishery** was not used to derive a CPUE abundance index because of difficulties incorporating searching time. It was **recommended** that consultation with harpoon fishermen be undertaken to explore possibilities.

2. It was **recommended** that an analysis of CPUE trends for August and September data only, the period when swordfish are targeted, be undertaken. If the trends differ, the August/September CPUE might be a better reflection of swordfish abundance.

3. It was **recommended** that a comparison of catch rates by the 2 hook types be undertaken using any available data or information which fishermen could supply. These data are presently unavailable in the computer data base.

4. It was **recommended** that the industry's co-operation be solicited to help identify a consistent set of index fishermen. It was also suggested that alternatives to classifying fishing on "prime" grounds versus less desirable grounds might be pursued. However, such analyses will be difficult or impossible as "prime" grounds are not easily quantified and may change from set to set.

5. It was widely recognized that **environmental conditions** can have a significant influence on CPUE. The analysis attempts to remove any environmental aspects that might be associated with seasonal or spatial variations but these are at a very coarse level. Further investigation of using local environmental co-variates is encouraged.

6. It is **recommended** that the vessel size composition by year be documented.

7. Other countries, notably the USA, fish in some of the same areas as Canada. It is expected that catch rates from the various fleets should reflect the abundance in commonly fished areas. Treating data from all countries by biological areas, as opposed to the current statistical areas, in a combined analysis may overcome some of the perceived data limitations. Further consideration should be given to alternatives for aggregating the trends in the various biological areas. It is **recommended** that initial exploration of these issues be considered using combined Canadian and USA data for feeding area 91.

8. There appears to be a discontinuity in the data and the results between 1992 and 1994. Mandatory submission of log records was introduced in 1994. It is not clear if the vessels submitting log records between 1988-93 were representative of the fleet. The decline in CPUE between 1992-94 may have been impacted by this change in statistical reporting. The

reporting since 1994 covers a broader season than in earlier years. Possible complications arising from this change should be evident from the analysis of August and September records which was recommended above. The change in hook type also roughly corresponds with this discontinuity. It was **recommended** that the comparability of data prior to 1992 or 1993 be considered suspect in subsequent use as indices of abundance.

9. Concern was expressed about possible interactions of area/month effects with year. It was reported that previous investigation of year interactions was not conclusive but more years are available now. It was **recommended** that year interactions be investigated.

10. The results displayed strong year effects at all ages and little evidence that year-class strength could be identified and followed over ages. This lack of internal consistency undermines interpretation of the CPUE series as reflective of abundance. It is **recommended** that subsequent use of this and other CPUE series be carefully scrutinized to validate their interpretation as indices of abundance. (Recommendation for the attention of the ICCAT Swordfish Working Group).

11. The decline in CPUE during the early 1990s seemed more pronounced for the Canadian series than for CPUE series of other nations. It was noted that this may be related to the perceived discontinuity discussed above. It was **recommended** that the time series of Canadian CPUE be compared to the VPA results to investigate any evidence for a discontinuity, i.e. was there a marked time trend in the residuals.

12. It is **recommended** that the revised sexed catch at age results which have been extended to ages 9+ be carefully scrutinized to confirm their reliability, including consultation with other ICCAT scientists.

*From the discussions of:, **"Estimation of the Tonnage of Dead Swordfish and Bluefin Tuna Discards from the 1998 Canadian Swordfish Longline Fishery")***

1. The **regulation of a minimum size** with no tolerance, which was put in place to protect small fish has resulted in (1) discarding/dumping of small swordfish and tuna, (2) and a loss of data on these smaller animals in the catch. It was suggested that this management strategy was not working, and that it should be reviewed. Further, it was noted that the observer coverage had not been directed in order to get an accurate picture of this fishery – but to monitor specific important management questions. Documentation of the magnitude of the small fish problem (and related problem of dead discards) would require substantial change to sampling, in order to achieve appropriate temporal and spatial coverage. It was **recommended** that there be consideration of improved sampling for future fisheries, and that Science should be consulted in the deployment schedule.